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The California State University Entry Level Mathematics Test Validity Study

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The California State University Entry Level Mathematics Test Validity Study

The California State University Entry Level Mathematics Placement Test (ELM) is developed cooperatively by the California State University (CSU) and Educational Testing Service (ETS). It is designed to measure the level of mathematics skills of newly-admitted undergraduate students entering the CSU system. The ELM test assesses students' level of skills in the areas of mathematics typically covered in three years of rigorous college preparatory mathematics courses in high school.

A cutscore of 50 has been set on the ELM test. Students that perform at or above this cutscore are ready for college-level, baccalaureate mathematics courses for freshmen. Students that perform below the cutscore are typically required to enroll in remedial, pre-baccalaureate courses.¹ The ELM test is not a condition for admission to the CSU system, but it is a condition for enrollment.² It must be completed by all non-exempt undergraduates prior to placement in appropriate university mathematics coursework. Appendix A lists the various means of exemption from the ELM test.

The Entry Level Mathematics (ELM) testing program calls for ongoing validation, and the studies described in this report were designed to provide evidence of validity. An ELM validity study was conducted in 2003-2004.³ The current validity study for the ELM test replicated many of the analyses conducted in this previous study and also considered findings from a recent

¹ <http://www.calstate.edu/sas/documents/FocusonMath.pdf>

² http://www.csumathsuccess.org/elm_exam

³ Gao, R., Liu, J., and Moulder, B. (2004). The California State University Entry Level Mathematics Validity Study. SR-2003-86.

examination of the comparability of the ELM and the Mathematics Section of the SAT Reasoning Test (Banach and Dion, 2009).⁴

The validity studies for the ELM test were designed to answer the following questions:

- 1) Is the ELM an effective predictor of students' success in mathematics courses, where success is defined by final course grades?
- 2) Is the ELM an appropriate placement instrument for mathematics courses, as judged by instructors' ratings?
- 3) What is the relationship between student performance on the ELM and their performance on the SAT Mathematics and ACT Mathematics?
- 4) Is a score of 550 on SAT Mathematics efficient for exempting students from taking the ELM to be enrolled in regular freshmen mathematics courses?
- 5) Is a score of 23 on ACT Mathematics efficient for exempting students from taking the ELM to be enrolled in regular freshmen mathematics courses?

As part of this report, results of validity analyses for the Early Assessment Program (EAP)⁵ mathematics tests are also provided. Grade 11 students in California have the opportunity to take either the EAP Summative High School Mathematics test or the EAP Algebra II test to earn possible exemption from taking the ELM test if they enter the CSU system. The EAP mathematics tests are composed of selected items on the corresponding California Standards Tests as well as 13 augmentation items developed by the CSU. Depending on their performance on an EAP mathematics test, students receive a report on their exemption status:

⁴ Banach, D., and Dion, G. (2009). 2009 CSU ELM Validity Study: Examining the comparability between the CSU ELM test and the SAT Mathematics Reasoning Test.

⁵ A collaborative effort among the State Board of Education (SBE), the California Department of Education (CDE) and the California State University (CSU), the Early Assessment Program (EAP) was established to provide opportunities for students to assess their readiness for college-level English and mathematics in their junior year of high school, and to facilitate opportunities for them to improve their skills during their senior year.

“Unconditionally Exempt” which means “Ready for CSU college-level mathematics coursework,” “Conditionally Exempt” meaning “Ready for CSU college-level mathematics coursework – Conditional,” or “Not Exempt” which means “Not yet demonstrating readiness for CSU college-level mathematics coursework.”⁶

Analyses were conducted to evaluate whether EAP mathematics test results are appropriate for use in exempting students from taking the ELM. For the purpose of the analyses presented below, students who took the EAP-Algebra II and EAP-Summative High School Mathematics were combined and classified in terms of their EAP-mathematics exemption status.

Method

Participants

In the fall of 2008, campuses throughout the CSU system were asked to identify groups of student that would provide data for the validity study. On each campus, a CSU-designated faculty coordinator was asked to select 10 sections of students taking the lowest level of baccalaureate courses and another 10 sections of students taking the highest level of pre-baccalaureate courses to participate. Exceptions were made for campuses with very small and very large sizes of enrollment. For Channel Islands, Maritime Academy, and Humboldt, five sections from each course category participated; for Long Beach, Fullerton, and San Diego, 15 course sections from each course category participated.

⁶ Students who are classified as "Unconditionally Exempt" do not have to take the ELM test and are considered ready for college-level mathematics courses should they attend the CSU. Students who are classified as "Conditionally Exempt" are urged to participate in a senior-year experience class consisting of CSU-approved courses or activities that intend to improve students' mathematics skills. Successful completion of the senior-year experience means that conditionally exempt students do not have to take the ELM should they attend the CSU system. Otherwise, they have to take the ELM. Students who are "Not Exempt" also are urged to participate in the senior-year mathematics experience courses. However, non-exempt students are still required to take the ELM whether they have successfully completed the senior experience course or not.

Determining Type of Course and Method of Course Placement

In the 2004 validity study, students included in the analyses were stratified in terms of the specific types of courses that they were taking, i.e., calculus track, non-calculus track, higher developmental and lower developmental courses. In the current study, these kinds of course classifications were not available. As a result, the more general course designations of baccalaureate and pre-baccalaureate were used to define the strata used in the analyses.

For the students in this study, the exact method used to place them in their courses is unknown. For the purpose of examining the appropriateness of the ELM cutscore, all students with an ELM score were treated as if they were placed via the ELM. All students who did not have an ELM score were grouped together in the “Other” category in terms of placement method. Appendix A provides details on the “Other” methods of placement and the specific requirements for each.

Measures

ELM. The ELM placement test consists of 50 multiple-choice questions covering three content categories: Numbers and Data, Algebra, and Geometry. The reported score is based on 45 of these questions. The remaining five questions are being field tested for possible use on future tests. The ELM reporting scale ranges from 0 to 80 in increments of two.

Instructor’s judgment of student placement. Selected course instructors were contacted and asked to evaluate whether each student enrolled in their courses was placed in the appropriate level of mathematics coursework. Instructors were asked to classify each student into one of four categories. These categories were (1) Appropriately placed, (2) Should be Placed Higher, (3) Should be Placed Lower, and (4) Cannot Evaluate Due to Poor Attendance. The specific directions provided to instructors are given in Appendix B.

The original plan for the current study was to have instructors provide their ratings during the sixth week of classes at semester campuses or the fourth week of classes at quarter campuses, when the instructors had an opportunity to initially evaluate the students in terms of their level of mathematics skills upon entering the class. However, due to delays in data collection, instructors provided the ratings toward the end of the semester/quarter, and often after students had received their final course grades.

SAT. The Mathematics section on the SAT Reasoning Test assesses content knowledge and critical thinking skills deemed necessary for college success in mathematics. It has a total of 54 questions assessing skills in four content areas: numbers and operations, algebra and functions, geometry and measurement, and data analysis, statistics, and probability. It requires students to apply mathematical concepts and to use data literacy skills in interpreting tables, charts, and graphs. The score scale ranges from 200 to 800.

ACT. The ACT mathematics test measures skills needed in entry-level college courses in mathematics. ACT states that its scores provide an indicator of “college readiness”. The 60-question mathematics test covers pre-algebra, elementary algebra, intermediate algebra, plane geometry, coordinate geometry, and elementary trigonometry. Test scores range from 1 to 36 in intervals of one point.

EAP-Algebra II. The EAP-Algebra II test (EAP-AlgII) is composed of selected multiple-choice items from Grade 11 CST-Algebra II test and 13 EAP mathematics augmentation multiple-choice items that are developed by the ELM Test Development Committee. The number of selected CST questions may vary somewhat from year to year. Fifty CST questions were chosen in 2007 and 48 in 2008, resulting in a total of 63 questions for the 2007 and 61 for the 2008 EAP-AlgII.

The EAP-AlgII score scale ranges from 820 to 870 in intervals of one point. A scaled score at or above 856 has an exemption status of “Unconditionally Exempt.” A scaled score at or above 845 but below 856 has an exemption status of “Conditionally Exempt.” A scaled score below 845 is given exemption status of “Not Exempt.”

EAP-Summative High School Mathematics. The Summative High School Mathematics test (EAP-HSM) comprises selected multiple-choice items from Grade 11 CST-Summative High School Mathematics test and the same EAP augmentation multiple-choice items as in EAP-AlgII. The number of selected CST questions on this test may also vary somewhat from year to year. Forty-eight CST questions were chosen in 2007 and 50 in 2008, resulting in a total of 61 questions for the 2007 and 63 for the 2008 EAP-HSM.

The EAP-HSM reporting scale ranges from 900 to 950. A scaled score at or above 943 has an exemption status of “Unconditionally Exempt.” A scaled score at or above 920 but below 943 is given an exemption status of “Conditionally Exempt.” A scaled score below 920 is given an exemption status of “Not Exempt.”

Data Collection

Data were collected from December 2008 through March 2009. The data came from different sources. For students in the selected course sections, the campus registrar provided student personal information such as gender and ethnicity, course information and course grade, SAT Mathematics score, ACT Mathematics score, and exemption results on the two EAP mathematics tests. Students’ ELM scores came from the ETS data base. At each campus a coordinator for the study collected instructors’ ratings. All campuses were asked to provide instructors’ ratings, but only 10 campuses responded: Bakersfield, Long Beach, Los Angeles,

Monterey Bay, Northridge, Sacramento, San Bernardino, San Diego, San Francisco, and Stanislaus.

Results

Student Samples

Table 1 contains information about the demographic characteristics of the ELM validity study samples. The table shows that a total of 53,497 college freshmen from all 23 campuses participated in the study (“total freshmen”). Of these college freshmen, 35,761 students had final grades in mathematics courses (“freshmen with grades”) and 2,816 students had ratings provided by instructors on the appropriateness of their placement (“freshmen with ratings”). In all, 2,718 had both final course grades and instructors’ judgments. Students with valid ELM and SAT mathematics scores (“ELM freshman with SAT math”) numbered 21,622, whereas students with valid ELM and ACT mathematics scores (“ELM freshman with ACT math”) numbered 5,744. These samples were used to relate the ELM scores to the SAT and ACT mathematics scores, respectively.

The gender and ethnic makeup of the student samples is displayed in Table 1. There were more female students than male students in the sample. Hispanic and White students were the two largest ethnic groups, accounting for a total of approximately 65% of the validation freshmen sample. African American, Asian, Filipino, Native American, Pacific Islander, and other ethnic groups account for approximately 35% of the validation freshmen sample. Ethnic makeup varied somewhat across samples, and the samples differed in the degree to which they resembled the makeup for the total study sample. This should be kept in mind when generalizing results for particular samples.

Table 2 presents summary statistics describing the ELM scores for freshmen with valid ELM scores, freshmen with course grades, freshmen with instructor ratings, freshmen with SAT mathematics scores, and freshmen with ACT mathematics scores. The mean ELM scores ranged from 41 to 43 for all samples, with standard deviations around 12 for all samples except the instructor ratings sample ($SD = 8.9$) which had the smallest sample size ($n = 1,768$).

The sample used to evaluate the validity of the EAP mathematics tests was a subset of the 53,497 freshmen who participated in the ELM validity study, and for whom EAP test scores were available. Students included in the analyses below typically took the EAP tests in 2007 because they entered the CSU system in fall 2008. Of the 11,184 who took an EAP-mathematics test, 8,425 also took the ELM test. In all 8,249 freshmen who took an EAP-mathematics test had course grades that could be used to determine their Pass/Fail status.

The Relationship between ELM Scores and Final Course Grades

Table 3 displays by course type and method of placement the percentage of students achieving the passing grades of A, B, C, or Credit. The table also shows the percentage of students classified as Pass, Fail and as having No Grade. To assign students to the Pass/Fail categories, their final course grades were used. A grade of “C” or higher, “Credit,” or “Pass Credit” was classified as “Pass.” A grade of “D,” “F,” “No Credit,” “Pass No Credit,” or “Unsatisfactory” was classified as “Fail.” A grade of “Audit,” “Withdraw,” “Incomplete,” “Repeat,” or another way of indicating a student did not receive a grade was classified as “No Grade.” Appendix C provides the distribution of passing grades for each level or range of ELM score, for the total group and for gender and ethnic subgroups. Note that results based on 50 or fewer students should not be regarded as reliable. To allow a more detailed examination of the

relationship between ELM scores and final course grades, Table 3 also provided results for students in the ELM score range of 46 to 48.

Table 3 shows that in baccalaureate courses about 49% of the students with ELM scores of 50 or more achieved grades of A or B. Of students in these courses with ELM scores below 50, only about 16% achieved these grades. As Table 3 shows, large percentages of students with ELM scores below 50 opted to take the courses for credit only, and therefore did not receive letter grades. For students placed in the baccalaureate courses by other means, the percentage receiving As and Bs was about the same as those placed in these courses on the basis of their ELM scores of 50 or more.

Table 3 also shows that in all 77% of the students with ELM scores of 50 or more passed their baccalaureate courses. The percentage of students with ELM scores below 50 that passed their baccalaureate courses was similarly high, although over half of the students who passed took the courses just for credit. The pass rates were slightly higher for students placed by means other than the ELM test.

Among the students placed in pre-baccalaureate courses, Table 3 shows that about 33% of the 105 students with ELM scores greater than or equal to 50 had grades of A or B, whereas only about 22% of the students with ELM scores of less than 50 achieved these grades. When the overall pass rates were compared for these students a similar pattern was observed, with pass rates for the students obtaining high ELM scores greater than those for students with lower ELM scores. More specific information about the results given in Table 3 is as follows.

Baccalaureate courses.

Of the 4,414 students placed in baccalaureate freshmen mathematics courses by an ELM score of 50 or above, 20.2% received an A and 29.2% received a B in their courses. Among

those with ELM scores between 46 and 48, the corresponding percentages were considerably lower, 9.8% and 12.6%, respectively. For students with ELM scores below 46, only 3.7% had an A and 8.8% had a B.

As noted above, of the students with ELM scores at or above 50, 77.0% passed their courses, 19.9% failed, and 3.1% did not receive a grade. Of the 11,668 students who were placed into baccalaureate classes by means other than an ELM score, 81.5% passed, 16.2% failed, and 2.3% did not receive a grade. Altogether, 79.9% of the freshmen in baccalaureate courses passed, 17.7% failed, and 2.3% did not receive a grade.

As noted above, large percentages of students with lower ELM scores took their courses for credit rather than for a letter grade.

Pre-baccalaureate courses.

Again as noted above, Table 3 shows that greater percentages of students with high ELM scores achieved As and Bs when compared with the students with lower ELM scores. In all three ELM score ranges, significant percentages of students took their courses for credit only. For students placed in the pre-baccalaureate courses by other means, the percentage receiving As and Bs was about the same as those placed in these courses on the basis of ELM scores below 50.

Of the 11,978 students placed into a pre-baccalaureate class with ELM scores less than 50, 80.9% passed, 17.6% failed, and 1.4% did not receive a grade. Of the 4,635 students who were placed into their classes by means other than ELM, 81.0% passed, 17.6% failed, and 1.4% did not receive a grade. Overall, 80.1% of the 16,718 freshmen in pre-baccalaureate courses passed, 17.6% failed, and 1.4% did not receive a grade.

The Appropriateness of Student Placement as Judged by Instructors Ratings

Table 4 displays the percentage of students in each of the four categories of instructor ratings given their course type and method of course assignment. The table shows that for students enrolled in baccalaureate courses, the total percentage of students judged to be appropriately placed was 87.2%, which is high. Results were about 10 percentage points lower for students placed in pre-baccalaureate courses. Results for the two course types did not differ markedly for students placed using their ELM scores and those placed by other means. More detailed information about the findings in Table 4 is as follows.

Baccalaureate courses.

Of the 226 students placed into baccalaureate freshmen mathematics courses by an ELM score of 50 or above, 86.7% were rated as placed appropriately. Another 4.4% were said to be placed too low, and 6.6% were rated as placed too high, while 2.2% did not receive a rating due to poor attendance. Of the 418 students who were placed into the classes by means other than ELM, 87.8 % were rated as appropriately placed. Another 5.7% were said to be placed too low, and 5.3% were said to be placed too high.

Pre-baccalaureate courses.

Of the 1,443 students placed in pre-baccalaureate mathematics courses by an ELM score below 50, Table 4 shows that 75.1 % were said to be placed appropriately. An additional 12.7% were said to be placed too low, 9.4% were rated as placed too high, and 2.8% did not have a rating. Of the 588 students who were placed into the class by means other than ELM, 73.3% were rated as placed appropriately. An additional 13.1% were said to be placed too low, 10.0% were said to be placed too high, and 3.6% had no rating.

Relationship between ELM Scores and Scores on the SAT Mathematics Test and the ACT Mathematics Test

Correlations.

Table 5 displays the reliabilities of and the correlations between various tests. The reliabilities are presented in the diagonal cells of the table. Significant Pearson product moment correlations were obtained when ELM scores were correlated with SAT Mathematics ($r = .69, n = 21,622, p < .0001$) and ACT Mathematics ($r = .66, n = 5,744, p < .0001$) scores.

Table 5 shows that the ELM correlated positively with the other measures, as would be expected since the measures assess related constructs.

Probability of passing the ELM test using SAT Mathematics scores as the predictor.

Logistic regression was used to estimate the relationship between SAT Mathematics scores and the probability of passing the ELM cutscore of 50. SAT Mathematics scores were used as the predictor of achieving the ELM passing score. The model evaluated was

$$\text{Log}_e \left[\frac{P}{1-P} \right] = \beta_0 + \beta_1 \text{SAT}_M + \varepsilon,$$

where P is the probability of earning an ELM score of 50 or above, SAT_M is a student's score on the Mathematics section of the SAT Reasoning Test, and the β 's are parameters estimated from the data.

The model was statistically significant ($X^2 = 7,862.12, p < .0001$). Table 6a shows the estimated probabilities of earning an ELM score of at least 50 given various levels of SAT Mathematics score. The probability of attaining an ELM score of 50 or higher increased as SAT Mathematics scores increased. A score of 550 on the SAT Mathematics test was associated with a 0.82 probability of earning a score of 50 or higher on the ELM.

Probability of passing the ELM test using ACT Mathematics scores as the predictor.

Logistic regression was also performed to estimate the relationship between ACT Mathematics scores and the probability of passing the ELM cutscore of 50. ACT Mathematics scores were used as the predictor of achieving the ELM passing score. The model evaluated was

$$\text{Log}_e \left[\frac{P}{1-P} \right] = \beta_0 + \beta_1 \text{ACT}_M + \varepsilon,$$

where P is the probability of earning a particular ELM score of 50 or above, ACT_M is a student's ACT Mathematics reported score, and the β 's are parameters estimated from the data.

The model was statistically significant ($X^2 = 1692.52, p < .0001$). Table 6b contains the estimated probabilities of earning a score of at least 50 on the ELM given various score levels on the ACT Mathematics test. The probability of attaining an ELM score of 50 or higher increased as ACT Mathematics scores increase. A score of 23 on the ACT Mathematics test was associated with a 0.71 probability of earning a score of 50 or higher on the ELM.

Analyses for Ethnic Groups

Tables 7 through 16 summarize students' course passing rates and instructor ratings of the appropriateness of placement for African American, Asian, Filipino, Hispanic, and White students respectively, in baccalaureate and pre-baccalaureate courses, categorized by placement method. Again, note that results based on 50 or fewer students should not be regarded as reliable.

In general, the results showed that the passing rates were somewhat lower for African-American students and somewhat higher for Asian students than the passing rates observed for the total sample that are shown in Table 3. Passing rates for the other ethnic groups tended to resemble those for the total sample. With respect to instructor ratings, it is noted that 47 of the 48 Filipino students in baccalaureate courses were described as "Placed Appropriately", resulting

in a much higher percentages of students appropriately placed than other ethnic groups. All other results shown in these tables tended to be similar to those observed for the total sample. More details about the information given in these tables are as follows.

Analysis of students' performance shows that for students placed by their ELM scores in baccalaureate freshmen courses, 74.2% of African-American, 80.8% of Asian, 78.4% of Filipino, 76.0% of Hispanic, and 78.9% of White students passed the course. For ELM placed students in pre-baccalaureate courses, 72.6% of African-American, 87.5% of Asian, 85.6% of Filipino, 80.7% of Hispanic, and 83.1% of White students passed the course.

Analysis of instructor ratings shows that for students placed by ELM scores, in baccalaureate freshmen courses, 11 out of the 14 African-American, 46 out of the 49 Asian, all 16 of the Filipino, 89.6% of Hispanic, and 91.8% of White students were rated either as appropriately placed or placed too low. In pre-baccalaureate courses among those placed by ELM scores, 73.8% of African-American, 73.3% of Asian, 76.1% of Filipino, 73.8% of Hispanic, and 77.2% of White students were rated as appropriately placed.

Analyses for the Validity of the EAP-Mathematics Tests

Relationship between EAP-mathematics exemption status and performance on the ELM, SAT, and ACT tests.

Table 17 shows the means and standard deviations of students' scores on various tests by exemption status and course type. For both baccalaureate and pre-baccalaureate courses, the table shows that exempt students had higher average scores on the ELM, SAT Mathematics, and ACT Mathematics than did the conditionally exempt and non-exempt students, indicating that the EAP performance classifications did discriminate between students that differed in their skill level. The non-exempt students had the lowest average scores on all three tests.

Table 18 gives the ELM score levels attained by students classified as exempt, conditionally exempt, and not exempt. The table shows that exemption status was strongly related to the level of performance on the ELM test. More specifically, 83.3% of exempt students and 62.4% of conditionally exempt students had ELM scores of at least 50, whereas more than two-thirds of non-exempt students had ELM scores of 44 or below.

Relationship between EAP-mathematics exemption status and final course grades.

Table 19 gives the percentages of students achieving Pass, Fail and No Grade classifications by course type by exemption status. In general results indicated higher pass rates were attained by students with higher exemption status. More specifically, in baccalaureate freshmen mathematics courses, exempt students had higher pass rates than conditionally exempt students, who in turn had higher pass rates than those who were not exempt. In the pre-baccalaureate courses, Table 19 shows that 90.6% of the conditionally exempt and 82.7% of the not exempt students passed their courses.

Although 520 students had an instructor rating on the appropriateness of their placement in their college courses, their case counts by exemption status were too low to produce results that could be considered reliable. As a consequence, they are not presented.

Discussion

The analyses showed nearly half the students placed in baccalaureate courses who had ELM scores of at least 50 achieved grades of A or B in their courses. This level of achievement was notably greater than that observed for students with ELM scores below 50. This suggests that obtaining a score of 50 or greater on the ELM test was predictive of student success in baccalaureate courses, when this success is defined as obtaining grades of A or B. The results were similar to those obtained for students placed in baccalaureate courses by other means. Thus,

using a cutscore of 50 on the ELM test for placement in baccalaureate courses appears as effective as using other means for identifying students who will do well in these courses. A similar pattern was observed for students placed in pre-baccalaureate courses.

When student course performance was classified only as pass or fail, the findings showed similar pass rates in baccalaureate courses for students with ELM scores of at least 50 and for students with ELM scores below 50. Thus the ELM score classifications did not appear related to student success when this success is defined simply as passing a course. This undoubtedly is due to the fact that information about student achievement is lost when students' specific grades are ignored and all students that pass a course are grouped together and treated as equivalent. In other words, aggregating different types of passing grades in the baccalaureate courses appears to have obscured the distinction in the performance of students above and below the ELM cutscore, as revealed by earned grades of A and B. When results for students that took the pre-baccalaureate courses are considered, higher pass rates were observed for students with ELM scores of at least 50.

When the relationship of the ELM classifications to instructors' ratings was considered, most students placed in baccalaureate and pre-baccalaureate courses were rated as being placed appropriately in their courses, regardless of ELM classification. This finding was unexpected since students with ELM scores below 50 were expected to lack the skills required by baccalaureate courses. Because the instructors' ratings were collected near or at the end of each course rather than at the beginning, it may be that the instructors judged their students to be appropriately placed because the students were able to pass the course by improving their skills rather than because they had adequate skills at the beginning of the course. In a future study, it would be helpful to collect instructors' ratings early rather than late in the semester.

Results from the analyses conducted for specific ethnic groups revealed similar patterns for passing rates and instructors' ratings. This suggests that the validity of using the ELM to make placement decisions for members of the ethnic groups can be considered to be equivalent to that found for the population as a whole.

Students' ELM scores correlated well with their scores on SAT Mathematics and ACT Mathematics, which provides support for the validity of regarding the ELM as an appropriate measure of the mathematics skills needed by college-bound students. An exemption score of 550 on SAT Mathematics and 23 on ACT Mathematics seem reasonable for exempting students from taking the ELM to be enrolled in regular freshmen mathematics courses.

The special study by Banach and Dion (2009), which evaluated the alignment of the ELM and the Mathematics section of the SAT Reasoning Test, provided additional evidence of a strong relationship between these two measures. The overall findings indicated that the revised SAT Mathematics was comparable to the ELM, in the sense that the two tests assess knowledge of similar high-school mathematics content. This finding provides support for the validity of regarding students' ELM scores as indicative of their mathematics skill level, as well as the validity of using SAT Mathematics scores to decide students' course placement.

The results of analyses for the validity of the EAP-mathematics tests support the use of the exemption status reported on these tests as one means of exempting students from taking the ELM test. The EAP exemption classifications clearly discriminated between students that differed in their level of mathematics skills. A majority of students classified as exempt and conditionally exempt by the EAP-mathematics tests attained ELM scores of 50 or higher, whereas most of students classified as not exempt performed well below this ELM cutscore.

Finally, exempt and conditionally students later showed somewhat higher pass rates than did their non-exempt counterparts in both types of freshmen mathematics courses.

Limitations of the Studies

In this study, in order to evaluate the effectiveness of the ELM cutscore of 50, it was assumed that students with ELM scores were assigned to courses using this cutscore. This assumption was necessary to make, because collecting specific information about how students' course assignments were made fell beyond the purview of this ELM validity study. The assumption may not have held in all cases: Some students with ELM scores may have actually been placed into their courses by another means, including by instructor exception or self-selection. Campuses undoubtedly differ in terms of how the ELM scores and other sources of information are used for placement decisions. If other means were used to place students with ELM scores, they confound the meaning of the relationships found in the current study between students' ELM scores and their course performance. In a future study it would be helpful to gather specific information about the basis for the placement of students in their courses.

It is also the case that only the efficiency of the cutscore of 50 was examined. The efficiency of alternate cut scores should be examined for schools that use them when additional information is available.

Generalization of the findings of the validity studies provided in this report to the CSU system as a whole should be done cautiously. Although all 23 CSU campuses contributed students for the studies, on each campus only a number of sections were selected to participate from certain levels of baccalaureate and pre-baccalaureate courses. Included in this study were students from the lowest level of general education baccalaureate courses and the highest level of pre-baccalaureate courses. Therefore, these students may not be representative of the population

as a whole. Also the resulting restriction of range in course levels may have limited the power to distinguish, in terms of course passing rates, students with high ELM scores from those with lower ELM scores.

Instructors' ratings were collected from less than half of all campuses, and for small numbers of students at each campus. It is unlikely that these students and their instructors were representative of the population as a whole. Also the instructors' ratings were collected late in the semester or quarter rather than near the beginning, as was done in the 2004 validity study for the ELM. As a result, the ratings may reflect considerations other than the appropriateness of the student placement at the time the student entered the course. This also limits the comparability of the current results to those obtained in 2004.

Table 1. Summary Statistics Describing the Demographic Characteristics of the Validity Study Samples

	<u>Total Freshmen</u>		<u>Freshmen with Grades</u>		<u>Freshmen with Ratings</u>		<u>ELM Freshmen with SAT Math</u>		<u>ELM Freshmen with ACT Math</u>	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Total	53,497		35,761		2,816		21,622		5,744	
Gender										
Male	22,083	(41.3)	14,086	(39.4)	929	(33.0)	7,374	(34.1)	1,620	(28.2)
Female	30,120	(56.3)	20,856	(58.3)	1,887	(67.0)	13,758	(63.6)	3,950	(68.8)
Unclassified	1,294	(2.4)	819	(2.3)	0	(0.0)	490	(2.3)	174	(3.0)
Ethnicity										
African-American	3,934	(7.4)	3,036	(8.5)	255	(9.1)	2,153	(10.0)	588	(10.2)
Asian	5,633	(10.5)	3,639	(10.2)	371	(13.2)	2,090	(9.7)	452	(7.9)
Filipino	2,209	(4.1)	1,521	(4.3)	181	(6.4)	846	(3.9)	187	(3.3)
Hispanic	17,043	(31.9)	12,769	(35.7)	1,084	(38.5)	8,496	(39.3)	2,396	(41.7)
Native American	478	(0.9)	272	(0.8)	24	(0.9)	192	(0.9)	39	(0.7)
Pacific Islander	2,361	(4.4)	1,861	(5.2)	22	(0.8)	1,045	(4.8)	208	(3.6)
White	17,769	(33.2)	10,097	(28.2)	706	(25.1)	5,423	(25.1)	1,489	(25.9)
Unknown	4,070	(7.6)	2,566	(7.2)	173	(6.1)	1,377	(6.4)	385	(6.7)

Table 2. Summary Statistics Describing the ELM Scores for the Freshmen Samples

	Total ELM Freshmen	ELM Freshmen with Grades	ELM Freshmen with Ratings	ELM Freshmen with SAT Math	ELM Freshmen with ACT Math
N	24,622	19,369	1,768	21,622	5,744
Mean	42.9	41.1	42.5	43.0	41.2
Median	42.0	40.0	44.0	42.0	42.0
Mode	44.0	44.0	44.0	44.0	44.0
Std.	12.7	12.2	8.9	12.6	12.1
Minimum	2	2	12	2	2
Maximum	80	80	80	80	80

Table 3. Course Performance for Students Taking College Mathematics Courses

Course Description	N	% A	% B	% C	% Credit	% Pass	% Fail	% No Grade
Baccalaureate								
ELM ≥ 50	4,414	20.2	29.2	26.1	1.5	77.0	19.9	3.1
ELM < 50	2,852	5.0	10.6	10.9	51.3	77.8	20.8	1.4
$46 \leq \text{ELM} \leq 48$	538	10.8	18.0	14.1	38.1	81.0	16.5	2.4
ELM ≤ 44	2,314	3.7	8.8	10.2	54.4	77.1	21.8	1.1
Other	11,668	26.7	27.3	21.6	5.9	81.5	16.2	2.3
Total	18,934	21.9	25.2	21.0	11.7	79.9	17.7	2.3
Pre-baccalaureate								
ELM ≥ 50	105	15.2	18.1	11.4	41.0	85.7	14.3	0.0
ELM < 50	11,978	9.1	12.6	11.0	48.3	80.9	12.6	11.0
$46 \leq \text{ELM} \leq 48$	1,597	9.8	15.0	11.1	47.0	83.0	16.3	0.7
ELM ≤ 44	10,381	9.0	12.2	10.9	48.5	80.6	17.8	1.5
Other	4,635	7.7	10.6	10.4	52.3	81.0	17.6	1.4
Total	16,718	8.8	12.1	10.8	49.4	81.0	17.6	1.4
Grand Total	35,652	15.8	19.1	16.2	29.4	80.4	17.7	1.9

Table 4. Instructor Ratings of ELM Score Placement for College Mathematics Courses

Table 7. Instructor Ratings of ELM Score Placement for College Mathematics Courses									
Course Description	N	<u>Placed Too Low</u>		<u>Placed Appropriately</u>		<u>Placed Too High</u>		<u>Cannot Evaluate</u>	
		n	(%)	n	(%)	n	(%)	n	(%)
Baccalaureate									
ELM ≥ 50	226	10	4.4	196	86.7	15	6.6	5	2.2
ELM < 50	44	4	9.1	37	84.1	2	4.5	1	2.3
$46 \leq \text{ELM} \leq 48$	9	1	11.1	7	77.8	1	11.1	0	0.0
ELM ≤ 44	35	3	8.6	30	85.7	1	2.9	1	2.9
Other	418	24	5.7	367	87.8	22	5.3	5	1.2
Total	688	38	5.5	600	87.2	39	5.7	11	1.6
Pre-baccalaureate									
ELM ≥ 50	3	0	0.0	1	33.3	2	66.7	0	0.0
ELM < 50	1,443	183	12.7	1,084	75.1	136	9.4	40	2.8
$46 \leq \text{ELM} \leq 48$	367	57	15.5	278	75.7	23	6.3	9	2.5
ELM ≤ 44	1,076	126	11.7	806	74.9	113	10.5	31	2.9
Other	588	77	13.1	431	73.3	59	10.0	21	3.6
Total	2,034	260	12.8	1,516	74.5	197	9.7	61	3.0
Grand Total	2,722	298	10.9	2,116	77.7	236	8.7	72	2.6

Table 5. Reliability¹ and Correlations between ELM, SAT Mathematics, and ACT Mathematics Scores

	ELM	SAT Math	ACT Math
ELM	0.82		
SAT Math	0.69	0.93	
ACT Math	0.66	0.86	0.91

¹Reliabilities are reported on the diagonal.

Table 6a. Estimated Conditional Probability of Passing ELM Score of 50 by SAT Reasoning Mathematics

SAT Math	Mean ELM	N	Probability ELM \geq 50
800	64.0	1	1.00
760	78.0	1	1.00
750	42.0	1	1.00
740	16.0	1	1.00
720	75.0	4	1.00
710	76.0	2	1.00
700	80.0	1	1.00
690	73.5	4	1.00
680	67.5	8	0.99
670	72.9	11	0.99
660	70.7	11	0.99
650	65.6	32	0.99
640	70.3	32	0.98
630	68.1	39	0.98
620	63.0	31	0.97
610	64.8	54	0.96
600	62.6	69	0.95
590	62.5	106	0.93
580	59.0	103	0.91
570	59.5	130	0.89
560	58.4	128	0.86
550	55.2	234	0.82
540	55.9	827	0.77
530	54.0	913	0.72
520	52.4	970	0.66
510	51.0	1,122	0.60
500	49.8	1,347	0.53
490	47.8	1,239	0.46
480	46.6	1,093	0.39
470	45.3	1,293	0.33
460	44.0	1,152	0.27
450	42.2	1,379	0.22
440	40.7	1,087	0.18
430	39.9	939	0.14
420	38.5	1,020	0.11
410	36.4	1,193	0.09
400	35.6	842	0.07
390	34.0	627	0.05

SAT Math	Mean ELM	N	Probability ELM \geq 50
380	32.8	622	0.04
370	32.0	568	0.03
360	30.5	554	0.02
350	29.1	389	0.02
340	28.8	280	0.01
330	29.1	224	0.01
320	27.9	198	0.01
310	26.5	183	0.01
300	25.8	197	0.00
290	26.9	84	0.00
280	27.5	53	0.00
270	25.7	57	0.00
260	24.6	40	0.00
250	23.3	39	0.00
240	27.1	15	0.00
230	24.8	27	0.00
220	22.0	5	0.00
210	22.0	12	0.00
200	23.3	29	0.00

Table 6b. Estimated Conditional Probability of Passing ELM Score of 50 by ACT Mathematics

ACT Math	Mean ELM	N	Probability ELM \geq 50
34	40.7	3	1.00
33	36.0	1	1.00
32	65.0	2	1.00
31	79.0	2	0.99
30	70.0	3	0.99
29	68.0	13	0.98
28	64.0	20	0.97
27	66.6	32	0.95
26	60.9	41	0.92
25	54.9	84	0.87
24	54.0	113	0.80
23	52.2	156	0.71
22	50.8	410	0.60
21	48.5	527	0.47
20	46.5	479	0.35
19	44.3	630	0.25
18	41.5	707	0.17
17	37.9	806	0.11
16	33.6	979	0.07
15	29.6	502	0.04
14	25.8	169	0.03
13	25.8	48	0.02
12	29.0	8	0.01
11	30.7	6	0.01
10	22.0	1	0.00
9	26.0	1	0.00
4	18.0	1	0.00

Table 7. Passing Rates for Students Taking College Mathematics Courses: African-American

Course Description	<u>Pass</u>			<u>Fail</u>		<u>No Grade</u>	
	N	n	(%)	n	(%)	n	(%)
Baccalaureate							
ELM \geq 50	216	166	(76.9)	42	(19.4)	8	(3.7)
46 \leq ELM \leq 48	35	29	(82.9)	5	(14.3)	1	(2.9)
ELM \leq 44	279	198	(71.0)	75	(26.9)	6	(2.2)
Other	452	342	(75.7)	95	(21.0)	15	(3.3)
Total	982	735	(74.8)	217	(22.1)	30	(3.1)
Pre-baccalaureate							
ELM \geq 50	6	4	(66.7)	2	(33.3)	0	(0.0)
46 \leq ELM \leq 48	127	97	(76.4)	29	(22.8)	1	(0.8)
ELM \leq 44	1,390	1,005	(72.3)	367	(26.4)	18	(1.3)
Other	524	364	(69.5)	154	(29.4)	6	(1.1)
Total	2,047	1,470	(71.8)	552	(27.0)	25	(1.2)
Grand Total	3,029	2,205	(72.8)	769	(25.4)	55	(1.8)

Table 8. Instructor Ratings of Student Placement in College Mathematics Courses: African American

Course Description	<u>Placed too Low</u>			<u>Placed Appropriately</u>		<u>Placed too High</u>		<u>Cannot Evaluate</u>	
	N	n	(%)	n	(%)	n	(%)	n	(%)
Baccalaureate									
ELM \geq 50	12	0	(0.0)	9	(75.0)	2	(16.7)	1	(8.3)
46 \leq ELM \leq 48	0	0	(--)	0	(--)	0	(--)	0	(--)
ELM \leq 44	2	0	(0.0)	2	(100.0)	0	(0.0)	0	(0.0)
Other	15	0	(0.0)	14	(93.3)	1	(6.7)	0	(0.0)
Total	29	0	(0.0)	25	(86.2)	3	(10.3)	1	(3.4)
Pre-baccalaureate									
ELM \geq 50	1	0	(0.0)	1	(100.0)	0	(0.0)	0	(0.0)
46 \leq ELM \leq 48	31	4	(12.9)	23	(74.2)	2	(6.5)	2	(6.5)
ELM \leq 44	132	15	(11.4)	97	(73.5)	15	(11.4)	5	(3.8)
Other	43	0	(0.0)	37	(86.0)	4	(9.3)	2	(4.7)
Total	207	19	(9.2)	158	(76.3)	21	(10.1)	9	(4.3)
Grand Total	236	19	(8.1)	183	(77.5)	24	(10.2)	10	(4.2)

Table 9. Passing Rates for Students Taking College Mathematics Courses: Asian

Course Description	<u>Pass</u>			<u>Fail</u>		<u>No Grade</u>	
	N	n	(%)	n	(%)	n	(%)
Baccalaureate							
ELM \geq 50	556	443	(79.7)	96	(17.3)	17	(3.1)
46 \leq ELM \leq 48	36	27	(75.0)	9	(25.0)	0	(0.0)
ELM \leq 44	212	180	(84.9)	29	(13.7)	3	(1.4)
Other	1,548	1,321	(85.3)	205	(13.2)	22	(1.4)
Total	2,352	1,971	(83.8)	339	(14.4)	42	(1.8)
Pre-baccalaureate							
ELM \geq 50	13	13	(100.0)	0	(0.0)	0	(0.0)
46 \leq ELM \leq 48	167	147	(88.0)	20	(12.0)	0	(0.0)
ELM \leq 44	756	659	(87.2)	86	(11.4)	11	(1.5)
Other	329	292	(88.8)	35	(10.6)	2	(0.6)
Total	1,265	1,111	(87.8)	141	(11.1)	13	(1.0)
Grand Total	3,617	3,082	(85.2)	480	(13.3)	55	(1.5)

Table 10. Instructor Ratings of Student Placement in College Mathematics Courses: Asian

Course Description	<u>Placed too Low</u>			<u>Placed Appropriately</u>		<u>Placed too High</u>		<u>Cannot Evaluate</u>	
	N	n	(%)	n	(%)	n	(%)	n	(%)
Baccalaureate									
ELM \geq 50	45	3	(6.7)	39	(86.7)	1	(2.2)	2	(4.4)
46 \leq ELM \leq 48	0	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
ELM \leq 44	4	0	(0.0)	4	(100.0)	0	(0.0)	0	(0.0)
Other	117	9	(7.7)	107	(91.5)	1	(0.9)	0	(0.0)
Total	166	12	(7.2)	150	(90.4)	2	(1.2)	2	(1.2)
Pre-baccalaureate									
ELM \geq 50	2	0	(0.0)	0	(0.0)	2	(100.0)	0	(0.0)
46 \leq ELM \leq 48	31	7	(22.6)	24	(77.4)	0	(0.0)	0	(0.0)
ELM \leq 44	117	20	(17.1)	86	(73.5)	9	(7.7)	2	(1.7)
Other	49	11	(22.4)	30	(61.2)	6	(12.2)	2	(4.1)
Total	199	38	(19.1)	140	(70.4)	17	(8.5)	4	(2.0)
Grand Total	365	50	(13.7)	290	(79.5)	19	(5.2)	6	(1.6)

Table 11. Passing Rates for Students Taking College Mathematics Courses: Filipino

Course Description	<u>Pass</u>			<u>Fail</u>		<u>No Grade</u>	
	N	n	(%)	n	(%)	n	(%)
Baccalaureate							
ELM \geq 50	195	152	(77.9)	39	(20.0)	4	(2.1)
$46 \leq \text{ELM} \leq 48$	6	5	(83.3)	1	(16.7)	0	(0.0)
ELM \leq 44	31	25	(80.6)	6	(19.4)	0	(0.0)
Other	514	434	(84.4)	76	(14.8)	4	(0.8)
Total	746	616	(82.6)	122	(16.4)	8	(1.1)
Pre-baccalaureate							
ELM \geq 50	8	5	(62.5)	3	(37.5)	0	(0.0)
$46 \leq \text{ELM} \leq 48$	70	63	(90.0)	7	(10.0)	0	(0.0)
ELM \leq 44	423	361	(85.3)	54	(12.8)	8	(1.9)
Other	259	215	(83.0)	38	(14.7)	6	(2.3)
Total	760	644	(84.7)	102	(13.4)	14	(1.8)
Grand Total	1,506	1,260	(83.7)	224	(14.9)	22	(1.5)

Table 12. Instructor Ratings of Student Placement in College Mathematics Courses: Filipino

Course Description	<u>Placed too Low</u>			<u>Placed Appropriately</u>		<u>Placed too High</u>		<u>Cannot Evaluate</u>	
	N	n	(%)	n	(%)	n	(%)	n	(%)
Baccalaureate									
ELM \geq 50	15	0	(0.0)	15	(100.0)	0	(0.0)	0	(0.0)
$46 \leq \text{ELM} \leq 48$	0	0	(--)	0	(--)	0	(--)	0	(--)
ELM \leq 44	1	0	(0.0)	1	(100.0)	0	(0.0)	0	(0.0)
Other	32	1	(3.1)	31	(96.9)	0	(0.0)	0	(0.0)
Total	48	1	(2.1)	47	(97.9)	0	(0.0)	0	(0.0)
Pre-baccalaureate									
ELM \geq 50	0	0	(--)	0	(--)	0	(--)	0	(--)
$46 \leq \text{ELM} \leq 48$	27	5	(18.5)	22	(81.5)	0	(0.0)	0	(0.0)
ELM \leq 44	61	12	(19.7)	45	(73.8)	2	(3.3)	2	(3.3)
Other	42	6	(14.3)	31	(73.8)	4	(9.5)	1	(2.4)
Total	130	23	(17.7)	98	(75.4)	6	(4.6)	3	(2.3)
Grand Total	178	24	(13.5)	145	(81.5)	6	(3.4)	3	(1.7)

Table 13. Passing Rates for Students Taking College Mathematics Courses: Hispanic

Course Description	<u>Pass</u>			<u>Fail</u>		<u>No Grade</u>	
	N	n	(%)	n	(%)	n	(%)
Baccalaureate							
ELM \geq 50	1,574	1,171	(74.4)	350	(22.2)	53	(3.4)
$46 \leq \text{ELM} \leq 48$	203	169	(83.3)	27	(13.3)	7	(3.4)
ELM \leq 44	851	658	(77.3)	186	(21.9)	7	(0.8)
Other	2,862	2,220	(77.6)	571	(20.0)	71	(2.5)
Total	5,490	4,218	(76.8)	1,134	(20.7)	138	(2.5)
Pre-baccalaureate							
ELM \geq 50	40	38	(95.0)	2	(5.0)	0	(0.0)
$46 \leq \text{ELM} \leq 48$	583	475	(81.5)	105	(18.0)	3	(0.5)
ELM \leq 44	4,644	3,740	(80.5)	832	(17.9)	72	(1.6)
Other	1,980	1,605	(81.1)	346	(17.5)	29	(1.5)
Total	7,247	5,858	(80.8)	1,285	(17.7)	104	(1.4)
Grand Total	12,737	10,076	(79.1)	2,419	(19.0)	242	(1.9)

Table 14. Instructor Ratings of Student Placement in College Mathematics Courses: Hispanic

Course Description	<u>Placed too Low</u>			<u>Placed Appropriately</u>		<u>Placed too High</u>		<u>Cannot Evaluate</u>	
	N	n	(%)	n	(%)	n	(%)	n	(%)
Baccalaureate									
ELM \geq 50	87	6	(6.9)	72	(82.8)	7	(8.0)	2	(2.3)
$46 \leq \text{ELM} \leq 48$	7	1	(14.3)	5	(71.4)	1	(14.3)	0	(0.0)
ELM \leq 44	21	2	(9.5)	17	(81.0)	1	(4.8)	1	(4.8)
Other	78	2	(2.6)	66	(84.6)	7	(9.0)	3	(3.8)
Total	193	11	(5.7)	160	(82.9)	16	(8.3)	6	(3.1)
Pre-baccalaureate									
ELM \geq 50	0	0	(--)	0	(--)	0	(--)	0	(--)
$46 \leq \text{ELM} \leq 48$	151	20	(13.2)	110	(72.8)	15	(9.9)	6	(4.0)
ELM \leq 44	445	46	(10.3)	330	(74.2)	51	(11.5)	18	(4.0)
Other	255	31	(12.2)	191	(74.9)	23	(9.0)	10	(3.9)
Total	851	97	(11.4)	631	(74.1)	89	(10.5)	34	(4.0)
Grand Total	1,044	108	(10.3)	791	(75.8)	105	(10.1)	40	(3.8)

Table 15. Passing Rates for Students Taking College Mathematics Courses: White

Course Description	<u>Pass</u>			<u>Fail</u>		<u>No Grade</u>	
	N	n	(%)	n	(%)	n	(%)
Baccalaureate							
ELM \geq 50	1,293	1,024	(79.2)	231	(17.9)	38	(2.9)
$46 \leq \text{ELM} \leq 48$	153	126	(82.4)	24	(15.7)	3	(2.0)
ELM \leq 44	456	350	(76.8)	101	(22.1)	5	(1.1)
Other	4,396	3,624	(82.4)	655	(14.9)	117	(2.7)
Total	6,298	5,124	(81.4)	1,011	(16.1)	163	(2.6)
Pre-baccalaureate							
ELM \geq 50	31	25	(80.6)	6	(19.4)	0	(0.0)
$46 \leq \text{ELM} \leq 48$	467	394	(84.4)	71	(15.2)	2	(0.4)
ELM \leq 44	2,222	1,842	(82.9)	346	(15.6)	34	(1.5)
Other	1,051	878	(83.5)	158	(15.0)	15	(1.4)
Total	3,771	3,139	(83.2)	581	(15.4)	51	(1.4)
Grand Total	10,069	8,263	(82.1)	1,592	(15.8)	214	(2.1)

Table 16. Instructor Ratings of Student Placement for College Mathematics Courses: White

Course Description	N	<u>Placed too Low</u>		<u>Placed Appropriately</u>		<u>Placed too High</u>		<u>Cannot Evaluate</u>	
		n	(%)	n	(%)	n	(%)	n	(%)
Baccalaureate									
ELM \geq 50	54	1	(1.9)	48	(88.9)	5	(9.3)	0	(0.0)
$46 \leq \text{ELM} \leq 48$	0	0	(--)	0	(--)	0	(--)	0	(--)
ELM \leq 44	7	1	(14.3)	6	(85.7)	0	(0.0)	0	(0.0)
Other	143	12	(8.4)	121	(84.6)	9	(6.3)	1	(0.7)
Total	204	14	(6.9)	175	(85.8)	14	(6.9)	1	(0.5)
Pre-baccalaureate									
ELM \geq 50	0	0	(--)	0	(--)	0	(--)	0	(--)
$46 \leq \text{ELM} \leq 48$	95	13	(13.7)	77	(81.1)	4	(4.2)	1	(1.1)
ELM \leq 44	243	27	(11.1)	184	(75.7)	28	(11.5)	4	(1.6)
Other	147	22	(15.0)	103	(70.1)	17	(11.6)	5	(3.4)
Total	485	62	(12.8)	364	(75.1)	49	(10.1)	10	(2.1)
Grand Total	689	76	(11.0)	539	(78.2)	63	(9.1)	11	(1.6)

Table 17. Average ELM, SAT, and ACT Mathematics Scores by EAP-Mathematics Exemption Status

Course Description		<u>ELM</u>		<u>SAT Mathematics</u>		<u>ACT Mathematics</u>	
		n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
Baccalaureate	Exempt	71	61.9 (11.9)	221	577.3 (76.5)	49	24.4 (3.6)
	Conditional Exempt	1,529	54.6 (10.3)	2,605	523.6 (62.1)	596	22.3 (3.3)
	Not Exempt	1,550	45.1 (11.2)	1,605	464.2 (65.2)	418	19.5 (3.0)
	Total	3,150	50.1 (11.9)	4,431	504.8 (71.8)	1,063	21.3 (3.5)
Pre-baccalaureate	Exempt	15	47.6 (12.3)	21	529.0 (106.6)	3	19.7 (2.5)
	Conditional Exempt	678	42.2 (8.6)	668	468.6 (56.8)	172	19.5 (2.7)
	Not Exempt	2,895	35.9 (8.5)	2,636	420.1 (59.1)	765	17.3 (2.1)
	Total	3,588	37.1 (8.9)	3,325	430.6 (62.7)	940	17.7 (2.4)
Grand Total		6,738	43.2 (12.3)	7,756	472.9 (77.3)	2,003	19.6 (3.5)

Table 18. EAP-Mathematics Exemption Status in Comparison with ELM Score Levels

	N	<u>ELM \geq 50</u>		<u>46 \leq ELM \leq 48</u>		<u>ELM \leq 44</u>	
		n	(%)	n	(%)	n	(%)
Exempt	120	100	(83.3)	6	(5.0)	14	(11.7)
Conditionally Exempt	3,040	1,896	(62.4)	325	(10.7)	819	(26.9)
Not Exempt	5,265	1,101	(20.9)	558	(10.6)	3,606	(68.5)
Grand Total	8,425	3,097	(36.8)	889	(10.6)	4,439	(52.7)

Table 19. Passing Rates in College Mathematics Courses by EAP Exemption Status

Course Description	<u>Pass</u>		<u>Fail</u>		<u>No Grade</u>	
	N	n (%)	n (%)	n (%)	n (%)	n (%)
Baccalaureate						
Exempt	225	198 (88.0)	24 (10.7)	3 (1.3)		
Conditional Exempt	2,744	2,278 (83.0)	426 (15.5)	40 (1.5)		
Not Exempt	1,701	1,289 (75.8)	375 (22.0)	37 (2.2)		
Total	4,670	3,765 (80.6)	825 (17.7)	80 (1.7)		
Pre-baccalaureate						
Exempt	12	9 (75.0)	3 (25.0)	0 (0.0)		
Conditional Exempt	663	601 (90.6)	59 (8.9)	3 (0.5)		
Not Exempt	2,904	2,401 (82.7)	458 (15.8)	45 (1.5)		
Total	3,579	3,011 (84.1)	520 (14.5)	48 (1.3)		
Grand Total	8,249	6,776 (82.1)	1,345 (16.3)	128 (1.6)		

Appendix A

Exemptions from the Entry Level Mathematics Test

All entering undergraduates must take the ELM examination before enrolling in a course that satisfies the college-level mathematics requirement of the General Education-Breadth program. Exemptions from the test are given only to those students who can present proof of one of the following:

- Placement in the “Ready for CSU college-level mathematics courses” category on the Early Assessment Program (EAP) Mathematics test taken in conjunction with the 11th grade California Standards Test in Summative High School Mathematics or Algebra II,
- Placement in the “Ready for CSU college-level mathematics courses - Conditional” category on the Early Assessment Program (EAP) Mathematics test taken in conjunction with the 11th grade California Standards Test in High School Mathematics or Algebra II PLUS successful completion of a CSU-approved mathematics or math-related course or activity taken before you enroll at a CSU campus,
- A score of 550 or above on the mathematics portion of the College Board SAT Reasoning Test*,
- A score of 550 or above on a College Board SAT Subject Test in Mathematics (Level 1 or Level 2),
- A score of 23 or above on the ACT Mathematics Test taken October 1989 or later,
- A score of 3 or above on the College Board Advanced Placement Calculus AB or Calculus BC examination,
- A score of 3 or above on the College Board Advanced Placement Statistics examination, or
- Completion and transfer to the CSU of a college course that satisfies the requirement in Quantitative Reasoning, provided such a course was completed with a grade of C or better.

***NOTE:** The College Board SAT I and SAT II were renamed SAT Reasoning and SAT Subject Tests, respectively, beginning March 2005.

Appendix B

Directions for Instructor Rating of the Student Placement

For each entering freshman enrolled in your course/session in fall 2008, please make a judgment about whether the student is placed in the appropriate level of Mathematics or English course starting the 6th week (or 4th week at the quarter campus) into the course. This information will be used to evaluate cut scores of Entry Level Mathematics (ELM) and English Placement Test (EPT). In your rating, please discount factors such as willingness, effort, class participation and degree of improvement and do not base your rating on placement or exemption test scores. In addition, do not rely ONLY on the grades a student has earned so far. Instead, consider the “absolute quality” of the student’s work: Does the work indicate that the student began your class with the skills and knowledge needed to master the coursework without undue difficulty or exceptional striving? Alternatively, did the student begin your class already having mastered most of the skills or knowledge that will be the focus of your coursework? If you can answer “yes” to the first question or “no” to the second, the student was appropriately placed.

To collect the information described above, the class roster should suffice for most of the information needed. Please add a column to your roster and also use these categories listed below to describe each student. It will be necessary to augment the roster with your judgments of the student’s ability. Please use the number preceding the appropriate judgment below and place it next to the students name on the roster. If it would be easier, an Excel spreadsheet is included that contains the fields of information needed and a drop down box for the judgments. The spreadsheet is not populated with student information. Please select from the following categories that best describes each student:

1. **Appropriately Placed:** The student has adequate mastery of the underlying skills and knowledge required to learn the material of this course. That is, the student has the necessary understanding of the lower level Mathematics skills to learn the content. Try not to focus only on the grades earned so far but on the conceptual level of the student’s work. Students you place in this category should be able to pass the course as long as they apply themselves.
2. **Should Have Been Placed Higher:** The student has already mastered the general course content, even with a more than adequate understanding of the course content. S/he probably should be taking a higher level Mathematics course. Try not to focus only on the grades earned so far but on the conceptual level of the student’s work. Students you place in this category should be able to pass the course with little difficulty and could succeed in a higher level course as long as they apply themselves.
3. **Should Have Been Placed Lower:** The student has a serious lack of understanding of more than a few of the underlying concepts necessary to learn the material as presented in this course. That is, you believe that the student will have a very difficult time learning the concepts, even with considerable effort. Try not to focus on grades earned so far but on the conceptual level of the student’s work. Students you place in this category should be able to pass the course only with extraordinary effort and with considerable extra help outside the classroom.

4. **Cannot Evaluate Due to Poor Attendance:** The student has not attended enough or handed in adequate course work/projects so that you are unable to make a judgment on his/her ability. Use this category with caution. Your evaluation of each student is very important.

Please start and complete your evaluation between the 6th and 7th week (or the 4th and 5th week at the quarter campuses) into the course. Thank you for your time and thoughtfulness in completing this evaluation. At the end of the semester, please also include the final course grade for each student. If a column for the final grade is not included in the class roster, please can add one to provide such information.

Upon completion, please return the file or the class roster to the colleague who gave them to you. This colleague coordinates data collection on your campus and serves as campus coordinator.

If you have any questions, feel free to contact the campus coordinator or Connie Grueter at Email: cgrueter@ets.org or telephone: 916-403-2412. Your evaluation is greatly appreciated.

Appendix C

Distribution of passing grades in College Mathematics Courses for each level of ELM score: Total Group

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
80	31	28	90.3	13	7	8	0	0	0	--	0	0	0	0
78	33	32	97.0	15	8	8	1	0	0	--	0	0	0	0
76	40	35	87.5	18	11	5	1	0	0	--	0	0	0	0
74	65	53	81.5	24	16	11	2	0	0	--	0	0	0	0
72	65	55	84.6	22	18	14	1	0	0	--	0	0	0	0
70	102	81	79.4	34	23	22	2	2	2	100.0	0	1	1	0
68	119	100	84.0	36	30	30	4	3	3	100.0	0	1	0	2
66	146	116	79.5	38	46	28	4	1	1	100.0	0	0	0	1
64	281	237	84.3	79	88	65	5	3	2	66.7	0	1	0	1
62	285	232	81.4	69	89	69	5	4	4	100.0	1	0	0	3
60	398	296	74.4	75	116	102	3	5	4	80.0	2	0	0	2
58	402	326	81.1	75	131	112	8	8	8	100.0	0	1	1	6
56	601	464	77.2	127	167	164	6	18	15	83.3	3	2	3	7
54	657	483	73.5	103	179	188	13	23	20	87.0	3	10	3	4
52	559	396	70.8	79	172	140	5	14	12	85.7	1	1	4	6
50	630	466	74.0	86	188	184	8	24	19	79.2	6	2	0	11
46-48	538	436	81.0	58	97	76	205	1597	1325	83.0	157	240	178	750
44	401	310	77.3	30	71	65	144	1251	1017	81.3	119	181	168	549
42	301	222	73.8	22	41	44	115	952	765	80.4	82	119	121	443
40	255	190	74.5	9	21	33	127	968	811	83.8	128	150	100	433
38	272	222	81.6	7	23	28	164	1019	882	86.6	96	142	112	532
36	193	143	74.1	3	9	21	110	910	744	81.8	114	122	102	406
34	172	139	80.8	6	14	15	104	904	736	81.4	100	123	113	400

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
32	168	127	75.6	3	13	12	99	942	785	83.3	86	147	106	446
30	143	117	81.8	1	8	6	102	814	658	80.8	70	107	99	382
28	77	62	80.5	1	0	2	59	419	338	80.7	26	34	31	247
26	102	84	82.4	1	0	1	82	622	493	79.3	36	33	51	373
24	63	50	79.4	0	1	3	46	507	393	77.5	30	35	40	288
22	66	45	68.2	0	1	1	43	417	308	73.9	24	29	41	214
20	36	24	66.7	0	1	0	23	263	172	65.4	10	14	21	127
18	27	18	66.7	1	0	0	17	175	126	72.0	9	13	13	91
16	15	12	80.0	0	0	0	12	121	89	73.6	3	7	9	70
14	13	9	69.2	0	1	3	5	68	38	55.9	1	5	7	25
12	6	5	83.3	0	0	0	5	24	13	54.2	0	4	0	9
10	1	1	100.0	0	0	0	1	4	2	50.0	0	0	0	2
8	1	1	100.0	1	0	0	0	1	1	100.0	0	1	0	0
6	0	0	--	0	0	0	0	0	0	--	0	0	0	0
4	0	0	--	0	0	0	0	0	0	--	0	0	0	0
2	2	2	100.0	0	0	2	0	0	0	--	0	0	0	0
0	0	0	--	0	0	0	0	0	0	--	0	0	0	0
Total	7266	5619	77.3	1036	1590	1462	1531	12083	9786	81.0	1107	1525	1324	5830

Distribution of passing grades in College Mathematics Courses for each level of ELM score: African-American

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
80	1	1	100.0	1	0	0	0	0	0	--	0	0	0	0
78	2	2	100.0	0	1	1	0	0	0	--	0	0	0	0
76	1	1	100.0	1	0	0	0	0	0	--	0	0	0	0
74	0	0	--	0	0	0	0	0	0	--	0	0	0	0
72	3	3	100.0	2	0	1	0	0	0	--	0	0	0	0
70	1	1	100.0	0	0	1	0	0	0	--	0	0	0	0
68	5	4	80.0	0	1	3	0	0	0	--	0	0	0	0
66	4	4	100.0	1	2	1	0	0	0	--	0	0	0	0
64	8	6	75.0	0	3	3	0	0	0	--	0	0	0	0
62	13	12	92.3	1	7	3	1	1	1	100.0	0	0	0	1
60	16	14	87.5	3	8	3	0	0	0	--	0	0	0	0
58	13	9	69.2	1	6	2	0	0	0	--	0	0	0	0
56	36	30	83.3	6	15	9	0	2	1	50.0	1	0	0	0
54	38	27	71.1	2	13	12	0	1	0	0.0	0	0	0	0
52	36	25	69.4	4	11	10	0	0	0	--	0	0	0	0
50	39	27	69.2	4	12	11	0	2	2	100.0	1	1	0	0
46-48	35	29	82.9	3	10	2	14	127	97	76.4	12	9	6	70
44	35	24	68.6	0	8	3	13	102	79	77.5	11	14	6	48
42	26	17	65.4	3	2	1	11	79	59	74.7	3	6	12	38
40	25	17	68.0	1	0	4	12	94	72	76.6	8	6	7	51
38	26	21	80.8	1	2	3	15	123	109	88.6	5	14	16	74
36	31	25	80.6	1	1	2	21	110	86	78.2	8	11	14	53
34	18	13	72.2	0	0	0	13	105	77	73.3	11	8	12	46
32	20	12	60.0	0	2	0	10	126	95	75.4	7	15	5	68
30	17	10	58.8	0	1	0	9	125	88	70.4	9	10	17	52
28	14	11	78.6	0	0	0	11	62	50	80.6	2	4	7	37

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
26	18	14	77.8	0	0	0	14	114	81	71.1	4	1	7	69
24	12	9	75.0	0	0	1	8	87	59	67.8	5	4	3	47
22	17	12	70.6	0	0	0	12	88	54	61.4	1	3	6	44
20	5	2	40.0	0	0	0	2	56	30	53.6	1	3	3	23
18	8	5	62.5	0	0	0	5	41	24	58.5	3	1	1	19
16	3	3	100.0	0	0	0	3	42	25	59.5	1	2	2	20
14	3	2	66.7	0	0	1	1	24	12	50.0	0	0	1	11
12	1	1	100.0	0	0	0	1	11	5	45.5	0	1	0	4
10	0	0	--	0	0	0	0	1	0	0.0	0	0	0	0
8	0	0	--	0	0	0	0	0	0	--	0	0	0	0
6	0	0	--	0	0	0	0	0	0	--	0	0	0	0
4	0	0	--	0	0	0	0	0	0	--	0	0	0	0
2	0	0	--	0	0	0	0	0	0	--	0	0	0	0
0	0	0	--	0	0	0	0	0	0	--	0	0	0	0
Total	530	393	74.2	35	105	77	176	1523	1106	72.6	93	113	125	775

Distribution of passing grades in College Mathematics Courses for each level of ELM score: Asian

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
80	5	5	100.0	4	0	1	0	0	0	--	0	0	0	0
78	13	13	100.0	8	2	3	0	0	0	--	0	0	0	0
76	11	9	81.8	8	0	1	0	0	0	--	0	0	0	0
74	7	7	100.0	2	2	3	0	0	0	--	0	0	0	0
72	7	7	100.0	4	1	2	0	0	0	--	0	0	0	0
70	16	14	87.5	9	2	3	0	1	1	100.0	0	1	0	0
68	13	12	92.3	7	2	3	0	1	1	100.0	0	0	0	1
66	12	11	91.7	5	3	3	0	0	0	--	0	0	0	0
64	37	32	86.5	17	8	6	1	0	0	--	0	0	0	0
62	35	30	85.7	14	8	8	0	0	0	--	0	0	0	0
60	51	36	70.6	10	17	9	0	0	0	--	0	0	0	0
58	52	40	76.9	13	15	12	0	3	3	100.0	0	1	0	2
56	81	65	80.2	12	26	26	1	1	1	100.0	0	0	0	1
54	67	56	83.6	12	21	22	1	2	2	100.0	0	0	1	1
52	64	46	71.9	13	16	17	0	1	1	100.0	0	0	1	0
50	85	60	70.6	16	19	25	0	4	4	100.0	0	0	0	4
46-48	36	27	75.0	3	6	4	14	167	147	88.0	38	30	24	55
44	33	27	81.8	4	4	3	16	103	90	87.4	19	20	11	40
42	22	20	90.9	2	3	3	12	109	98	89.9	17	17	10	54
40	13	10	76.9	0	0	2	8	73	64	87.7	12	17	4	31
38	25	21	84.0	0	2	1	18	73	64	87.7	9	9	8	38
36	18	17	94.4	0	1	4	12	70	58	82.9	8	8	9	33
34	18	13	72.2	0	2	0	11	76	63	82.9	15	8	10	30
32	14	13	92.9	0	0	0	13	63	54	85.7	7	6	10	31
30	18	16	88.9	0	3	0	13	50	45	90.0	5	9	7	24
28	9	8	88.9	0	0	0	8	29	25	86.2	6	4	0	15

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
26	9	9	100.0	0	0	0	9	32	27	84.4	3	3	3	18
24	12	10	83.3	0	0	0	10	25	23	92.0	6	2	6	9
22	10	8	80.0	0	0	0	8	21	18	85.7	2	4	0	12
20	4	2	50.0	0	0	0	2	15	14	93.3	1	3	3	7
18	1	1	100.0	0	0	0	1	7	7	100.0	0	1	1	5
16	3	2	66.7	0	0	0	2	6	6	100.0	0	0	0	6
14	1	1	100.0	0	0	1	0	3	2	66.7	0	0	1	1
12	1	1	100.0	0	0	0	1	1	1	100.0	0	1	0	0
10	0	0	--	0	0	0	0	0	0	--	0	0	0	0
8	0	0	--	0	0	0	0	0	0	--	0	0	0	0
6	0	0	--	0	0	0	0	0	0	--	0	0	0	0
4	0	0	--	0	0	0	0	0	0	--	0	0	0	0
2	1	1	100.0	0	0	1	0	0	0	--	0	0	0	0
0	0	0	--	0	0	0	0	0	0	--	0	0	0	0
Total	804	650	80.8	163	163	163	161	936	819	87.5	148	144	109	418

Distribution of passing grades in College Mathematics Courses for each level of ELM score: Filipino

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
80	2	1	50.0	0	0	1	0	0	0	--	0	0	0	0
78	1	1	100.0	0	1	0	0	0	0	--	0	0	0	0
76	3	2	66.7	1	1	0	0	0	0	--	0	0	0	0
74	4	3	75.0	1	1	1	0	0	0	--	0	0	0	0
72	2	2	100.0	1	1	0	0	0	0	--	0	0	0	0
70	2	2	100.0	2	0	0	0	0	0	--	0	0	0	0
68	7	4	57.1	1	1	2	0	0	0	--	0	0	0	0
66	12	8	66.7	3	4	1	0	0	0	--	0	0	0	0
64	14	13	92.9	4	7	2	0	0	0	--	0	0	0	0
62	6	4	66.7	2	1	1	0	1	1	100.0	0	0	0	1
60	22	17	77.3	4	4	8	1	0	0	--	0	0	0	0
58	14	11	78.6	4	3	4	0	0	0	--	0	0	0	0
56	29	22	75.9	5	6	11	0	1	1	100.0	0	0	0	1
54	20	15	75.0	4	4	7	0	0	0	--	0	0	0	0
52	31	24	77.4	7	11	6	0	3	2	66.7	0	0	1	1
50	26	23	88.5	8	6	9	0	3	1	33.3	0	1	0	0
46-48	6	5	83.3	1	2	1	1	70	63	90.0	8	12	9	34
44	8	8	100.0	1	3	2	2	65	50	76.9	3	7	6	34
42	4	4	100.0	1	0	3	0	49	39	79.6	5	6	2	26
40	5	1	20.0	0	1	0	0	39	35	89.7	6	4	7	18
38	2	1	50.0	0	0	0	1	39	39	100.0	4	4	3	28
36	2	2	100.0	0	1	0	1	39	35	89.7	5	5	4	21
34	2	2	100.0	0	1	0	1	41	38	92.7	7	4	6	21
32	1	1	100.0	0	1	0	0	47	41	87.2	4	6	6	25
30	3	3	100.0	0	0	1	2	29	26	89.7	3	8	2	13
28	1	1	100.0	0	0	1	0	19	16	84.2	3	1	0	12

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
26	1	1	100.0	0	0	0	1	21	19	90.5	4	1	1	13
24	0	0	--	0	0	0	0	12	9	75.0	0	1	3	5
22	2	1	50.0	0	0	0	1	9	7	77.8	0	2	1	4
20	0	0	--	0	0	0	0	4	3	75.0	1	1	0	1
18	0	0	--	0	0	0	0	4	2	50.0	0	1	0	1
16	0	0	--	0	0	0	0	4	2	50.0	0	1	0	1
14	0	0	--	0	0	0	0	2	0	0.0	0	0	0	0
12	0	0	--	0	0	0	0	0	0	--	0	0	0	0
10	0	0	--	0	0	0	0	0	0	--	0	0	0	0
8	0	0	--	0	0	0	0	0	0	--	0	0	0	0
6	0	0	--	0	0	0	0	0	0	--	0	0	0	0
4	0	0	--	0	0	0	0	0	0	--	0	0	0	0
2	0	0	--	0	0	0	0	0	0	--	0	0	0	0
0	0	0	--	0	0	0	0	0	0	--	0	0	0	0
Total	232	182	78.4	50	60	61	11	501	429	85.6	53	65	51	260

Distribution of passing grades in College Mathematics Courses for each level of ELM score: Hispanic

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
80	7	7	100.0	3	2	2	0	0	0	--	0	0	0	0
78	5	5	100.0	3	2	0	0	0	0	--	0	0	0	0
76	10	9	90.0	4	3	1	1	0	0	--	0	0	0	0
74	30	23	76.7	11	6	5	1	0	0	--	0	0	0	0
72	15	12	80.0	2	6	4	0	0	0	--	0	0	0	0
70	31	25	80.6	9	8	6	2	1	1	100.0	0	0	1	0
68	44	37	84.1	13	14	8	2	0	0	--	0	0	0	0
66	57	39	68.4	13	14	9	3	0	0	--	0	0	0	0
64	95	77	81.1	26	30	20	1	1	1	100.0	0	1	0	0
62	97	80	82.5	25	33	20	2	2	2	100.0	1	0	0	1
60	138	104	75.4	24	40	40	0	2	2	100.0	2	0	0	0
58	148	125	84.5	23	47	53	2	2	2	100.0	0	0	0	2
56	215	158	73.5	48	49	58	3	8	7	87.5	2	2	3	0
54	247	170	68.8	39	56	70	5	12	12	100.0	2	7	2	1
52	213	142	66.7	22	65	54	1	5	4	80.0	1	0	1	2
50	222	158	71.2	21	68	67	2	7	7	100.0	5	0	0	2
46-48	203	169	83.3	21	39	33	76	583	475	81.5	46	87	60	282
44	139	112	80.6	16	24	32	40	483	396	82.0	45	69	70	212
42	114	85	74.6	8	19	21	37	385	301	78.2	25	49	43	184
40	115	88	76.5	4	11	15	58	400	345	86.3	49	71	35	190
38	99	80	80.8	3	7	14	56	444	389	87.6	42	60	41	246
36	72	48	66.7	1	4	9	34	395	315	79.7	53	50	43	169
34	79	68	86.1	2	7	13	46	390	309	79.2	25	53	54	177
32	57	43	75.4	3	3	6	31	422	348	82.5	41	68	50	189
30	46	36	78.3	0	3	1	32	401	323	80.5	31	55	43	194
28	26	21	80.8	1	0	1	19	220	172	78.2	10	15	16	131

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
26	32	28	87.5	0	0	1	27	310	254	81.9	15	13	24	202
24	22	17	77.3	0	0	2	15	272	212	77.9	11	11	16	174
22	17	9	52.9	0	1	0	8	217	164	75.6	14	7	21	122
20	9	6	66.7	0	0	0	6	132	83	62.9	3	2	7	71
18	10	7	70.0	0	0	0	7	89	69	77.5	5	5	5	54
16	5	3	60.0	0	0	0	3	43	33	76.7	1	2	3	27
14	6	5	83.3	0	1	1	3	31	20	64.5	1	3	3	13
12	3	2	66.7	0	0	0	2	8	5	62.5	0	1	0	4
10	0	0	--	0	0	0	0	1	1	100.0	0	0	0	1
8	0	0	--	0	0	0	0	1	1	100.0	0	1	0	0
6	0	0	--	0	0	0	0	0	0	--	0	0	0	0
4	0	0	--	0	0	0	0	0	0	--	0	0	0	0
2	0	0	--	0	0	0	0	0	0	--	0	0	0	0
0	0	0	--	0	0	0	0	0	0	--	0	0	0	0
Total	2628	1998	76.0	345	562	566	525	5267	4253	80.7	430	632	541	2650

Distribution of passing grades in College Mathematics Courses for each level of ELM score: White

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
80	7	7	100.0	3	2	2	0	0	0	--	0	0	0	0
78	7	6	85.7	3	1	2	0	0	0	--	0	0	0	0
76	11	11	100.0	4	5	2	0	0	0	--	0	0	0	0
74	20	16	80.0	7	7	1	1	0	0	--	0	0	0	0
72	25	21	84.0	9	6	6	0	0	0	--	0	0	0	0
70	32	29	90.6	10	11	8	0	0	0	--	0	0	0	0
68	32	29	90.6	10	8	10	1	2	2	100.0	0	1	0	1
66	43	37	86.0	14	12	11	0	1	1	100.0	0	0	0	1
64	83	72	86.7	21	29	21	1	1	1	100.0	0	0	0	1
62	97	77	79.4	23	28	25	1	0	0	--	0	0	0	0
60	113	82	72.6	23	28	29	2	3	2	66.7	0	0	0	2
58	131	104	79.4	26	44	31	3	1	1	100.0	0	0	1	0
56	168	133	79.2	36	56	40	1	6	5	83.3	0	0	0	5
54	213	164	77.0	34	65	60	5	6	4	66.7	1	1	0	2
52	145	110	75.9	22	51	35	2	4	4	100.0	0	1	1	2
50	166	126	75.9	24	54	47	1	7	5	71.4	0	0	0	5
46-48	153	126	82.4	23	22	23	58	467	394	84.4	37	79	66	212
44	89	68	76.4	4	14	14	36	368	295	80.2	33	54	59	149
42	75	55	73.3	4	13	8	30	242	194	80.2	20	32	40	102
40	50	40	80.0	3	5	8	24	255	212	83.1	43	38	35	96
38	65	56	86.2	2	7	9	38	258	210	81.4	28	38	37	107
36	38	25	65.8	1	2	3	19	205	176	85.9	31	42	23	80
34	25	23	92.0	3	2	1	17	206	174	84.5	29	39	26	80
32	30	18	60.0	0	3	4	11	198	175	88.4	21	37	28	89
30	32	28	87.5	1	1	3	23	139	120	86.3	18	20	22	60
28	10	7	70.0	0	0	0	7	61	51	83.6	4	6	5	36

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
26	17	12	70.6	0	0	0	12	94	77	81.9	7	11	13	46
24	5	4	80.0	0	1	0	3	72	60	83.3	6	13	10	31
22	7	4	57.1	0	0	0	4	49	40	81.6	5	9	10	16
20	8	5	62.5	0	1	0	4	29	24	82.8	3	4	4	13
18	2	2	100.0	1	0	0	1	24	15	62.5	1	5	3	6
16	1	1	100.0	0	0	0	1	15	15	100.0	1	1	2	11
14	0	0	--	0	0	0	0	5	3	60.0	0	2	1	0
12	1	1	100.0	0	0	0	1	2	1	50.0	0	1	0	0
10	0	0	--	0	0	0	0	0	0	--	0	0	0	0
8	0	0	--	0	0	0	0	0	0	--	0	0	0	0
6	0	0	--	0	0	0	0	0	0	--	0	0	0	0
4	0	0	--	0	0	0	0	0	0	--	0	0	0	0
2	1	1	100.0	0	0	1	0	0	0	--	0	0	0	0
0	0	0	--	0	0	0	0	0	0	--	0	0	0	0
Total	1902	1500	78.9	311	478	404	307	2720	2261	83.1	288	434	386	1153

Distribution of passing grades in College Mathematics Courses for each level of ELM score: Male

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
80	23	20	87.0	5	7	8	0	0	0	--	0	0	0	0
78	20	19	95.0	10	4	4	1	0	0	--	0	0	0	0
76	20	17	85.0	10	4	2	1	0	0	--	0	0	0	0
74	35	25	71.4	9	9	5	2	0	0	--	0	0	0	0
72	38	31	81.6	11	10	10	0	0	0	--	0	0	0	0
70	51	40	78.4	16	9	13	2	2	2	100.0	0	1	1	0
68	70	55	78.6	18	18	15	4	2	2	100.0	0	1	0	1
66	79	59	74.7	14	25	16	4	0	0	--	0	0	0	0
64	147	117	79.6	32	44	36	5	1	1	100.0	0	0	0	1
62	132	99	75.0	23	35	36	5	1	1	100.0	0	0	0	1
60	185	127	68.6	28	47	50	2	2	1	50.0	0	0	0	1
58	175	138	78.9	21	51	61	5	5	5	100.0	0	1	1	3
56	250	182	72.8	41	62	75	4	16	13	81.3	2	1	3	7
54	243	163	67.1	31	49	73	10	12	11	91.7	0	8	2	1
52	221	146	66.1	18	63	61	4	9	8	88.9	1	1	4	2
50	260	179	68.8	32	69	72	6	12	8	66.7	3	1	0	4
46-48	200	157	78.5	17	35	27	78	540	436	80.7	36	80	62	258
44	161	122	75.8	11	23	27	61	407	315	77.4	30	59	51	175
42	98	67	68.4	8	12	14	33	282	219	77.7	21	31	37	130
40	103	72	69.9	1	7	10	54	301	246	81.7	28	42	33	143
38	102	76	74.5	1	2	11	62	273	229	83.9	16	35	32	146
36	59	36	61.0	0	1	3	32	277	214	77.3	31	26	34	123
34	53	42	79.2	1	3	4	34	227	175	77.1	19	27	36	93
32	49	34	69.4	0	3	0	31	249	187	75.1	18	26	33	110
30	43	35	81.4	0	4	0	31	213	161	75.6	19	26	30	86
28	26	20	76.9	0	0	1	19	106	77	72.6	6	5	6	60

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
26	36	30	83.3	0	0	1	29	159	119	74.8	4	6	12	97
24	20	16	80.0	0	0	2	14	106	82	77.4	3	6	8	65
22	17	7	41.2	0	0	0	7	96	64	66.7	4	6	13	41
20	8	5	62.5	0	0	0	5	52	32	61.5	1	2	3	26
18	9	6	66.7	0	0	0	6	45	36	80.0	2	2	5	27
16	6	5	83.3	0	0	0	5	26	18	69.2	0	2	2	14
14	6	3	50.0	0	0	2	1	21	9	42.9	0	3	1	5
12	0	0	--	0	0	0	0	7	3	42.9	0	0	0	3
10	0	0	--	0	0	0	0	1	0	0.0	0	0	0	0
8	1	1	100.0	1	0	0	0	1	1	100.0	0	1	0	0
6	0	0	--	0	0	0	0	0	0	--	0	0	0	0
4	0	0	--	0	0	0	0	0	0	--	0	0	0	0
2	2	2	100.0	0	0	2	0	0	0	--	0	0	0	0
0	0	0	--	0	0	0	0	0	0	--	0	0	0	0
Total	2948	2153	73.0	359	596	641	557	3451	2675	77.5	244	399	409	1623

Distribution of passing grades in College Mathematics Courses for each level of ELM score: Female

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
80	7	7	100.0	7	0	0	0	0	0	--	0	0	0	0
78	13	13	100.0	5	4	4	0	0	0	--	0	0	0	0
76	20	18	90.0	8	7	3	0	0	0	--	0	0	0	0
74	28	26	92.9	14	7	5	0	0	0	--	0	0	0	0
72	26	23	88.5	11	7	4	1	0	0	--	0	0	0	0
70	50	40	80.0	18	13	9	0	0	0	--	0	0	0	0
68	47	43	91.5	18	10	15	0	1	1	100.0	0	0	0	1
66	63	54	85.7	24	21	9	0	1	1	100.0	0	0	0	1
64	129	117	90.7	46	43	28	0	2	1	50.0	0	1	0	0
62	148	130	87.8	46	52	32	0	3	3	100.0	1	0	0	2
60	208	166	79.8	46	69	50	1	3	3	100.0	2	0	0	1
58	218	182	83.5	54	75	50	3	3	3	100.0	0	0	0	3
56	343	278	81.0	85	103	88	2	2	2	100.0	1	1	0	0
54	397	312	78.6	71	128	110	3	10	8	80.0	3	1	1	3
52	325	241	74.2	61	103	76	1	5	4	80.0	0	0	0	4
50	358	278	77.7	52	114	110	2	12	11	91.7	3	1	0	7
46-48	332	273	82.2	39	61	46	127	1003	848	84.5	114	141	101	492
44	239	187	78.2	19	48	37	83	806	673	83.5	85	114	100	374
42	202	154	76.2	14	28	30	82	641	526	82.1	57	82	74	313
40	152	118	77.6	8	14	23	73	642	552	86.0	99	103	60	290
38	170	146	85.9	6	21	17	102	713	636	89.2	79	100	71	386
36	133	107	80.5	3	8	18	78	610	512	83.9	78	87	64	283
34	119	97	81.5	5	11	11	70	650	541	83.2	76	86	72	307
32	118	93	78.8	3	10	12	68	671	578	86.1	62	113	67	336
30	100	82	82.0	1	4	6	71	586	484	82.6	48	73	67	296
28	51	42	82.4	1	0	1	40	306	254	83.0	17	29	21	187

ELM score	Baccalaureate							Pre-baccalaureate						
	N	n pass	% pass	n A	n B	n C	n Credit	N	n pass	% pass	n A	n B	n C	n Credit
26	66	54	81.8	1	0	0	53	454	369	81.3	31	24	38	276
24	43	34	79.1	0	1	1	32	388	301	77.6	26	25	27	223
22	49	38	77.6	0	1	1	36	318	241	75.8	20	22	26	173
20	28	19	67.9	0	1	0	18	205	138	67.3	9	11	17	101
18	18	12	66.7	1	0	0	11	127	88	69.3	7	9	8	64
16	9	7	77.8	0	0	0	7	95	71	74.7	3	5	7	56
14	7	6	85.7	0	1	1	4	46	28	60.9	1	2	5	20
12	6	5	83.3	0	0	0	5	17	10	58.8	0	4	0	6
10	1	1	100.0	0	0	0	1	3	2	66.7	0	0	0	2
8	0	0	--	0	0	0	0	0	0	--	0	0	0	0
6	0	0	--	0	0	0	0	0	0	--	0	0	0	0
4	0	0	--	0	0	0	0	0	0	--	0	0	0	0
2	0	0	--	0	0	0	0	0	0	--	0	0	0	0
0	0	0	--	0	0	0	0	0	0	--	0	0	0	0
Total	4223	3403	80.6	667	965	797	974	8323	6889	82.8	822	1034	826	4207